REMARKS

In view of the above amendments and the following remarks, reconsideration of the outstanding office action is respectfully requested.

Claim 1 has been amended to recite the following: "wherein the amount and/or distribution of adhesive applied to each individual pocket is varied." Support for this amendment is found in the specification as filed on page 2, line 26 to page 3, line 2. Claims 26-36 have been cancelled. Thus, no new matter has been entered.

The rejection of claims 1-2, 5, and 9 under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,143,122 to Mossbeck et al. ("Mossbeck") is respectfully traversed.

As amended, claim 1 of the present application relates to a method for the manufacture of an innerspring assembly, which method comprises the steps of a) positioning a first string of pocketed coil springs in juxtaposition with a *plurality of adhesive applicators* disposed in mutually fixed relation on an axis parallel to a longitudinal axis of said first string, b) applying adhesive from said adhesive applicators to said first string of pocketed coil springs, *wherein the amount and/or distribution of adhesive applied to each individual pocket is varied*, and c) bringing said first string into adhesive contact with a second string of pocketed coil springs.

The present application claims priority to U.K. Patent Application No. 9905964.4, filed March 17, 1999. Mossbeck was filed April 7, 1999, and is a continuation-in-part of U.S. Patent Application Serial No. 09/153,445 ("the '445 application") (a copy of which is enclosed herewith), filed September 15, 1998.

Mossbeck teaches a method and system for the manufacture of spring core assemblies from strings of pocketed coil springs (column 2, lines 49-51). The method includes a moving adhesive applicator applying adhesive to a moving string of pocketed coil springs to provide a pattern of adhesive on the central portion of each individually pocketed coil spring (column 3, lines 6-11). While Mossbeck further teaches the use of multiple nozzles to increase the precision and accuracy of applying the adhesive (column 3, lines 22-26) and independently and selectively spraying adhesive onto the string (column 3, lines 26-28) in order to vary the pattern of adhesive applied to the side of the moving string to change the deflection characteristics or feel of the resulting spring unit (column 3, lines 58-62), such teachings are not found in the '445 application. Rather, the '445 application merely states that a plurality of nozzles may be mounted upon an adhesive applicator for a direct and continuous spray on the string of pocketed coil springs such that a continuous spray pattern is

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formed (page 13, line 16 to page 14, line 7). Moreover, the plurality of nozzles described by the '445 application in relation to Figure 3 are mounted to a single adhesive applicator (page 14, lines 4-7) such that the amount of adhesive dispensed from the plurality of nozzles cannot be independently varied. Hence, employing the plurality of nozzles as taught by the '445 application would hinder, rather than aid, any attempt to vary the amount and/or distribution of adhesive applied to each individual pocket in a string of pocketed coil springs.

By varying the amount and/or distribution of adhesive applied to each individual pocket, it is possible to control the firmness of regions of the innerspring assembly of the present application. Furthermore, employing a plurality of adhesive applicators enables adhesive to be applied simultaneously, or substantially simultaneously, to a plurality of pockets of the string of pocketed coil springs, wherein the amount and/or distribution of adhesive applied to each individual pocket may be varied, thereby achieving an increase in operating speed and throughput for the manufacture of innerspring assemblies whilst also enabling control of the firmness of regions of the innerspring assembly. A person skilled in the art wishing to devise a method of manufacturing an innerspring assembly that enables control of the firmness of regions of the innerspring assembly would not be motivated by the '445 application to vary the amount and/or distribution of adhesive applied to each individual pocket of a string of pocketed coil springs with a plurality of adhesive applicators. In contrast, as discussed *supra*, the '445 application teaches a method utilizing a plurality of adhesive applicator nozzles that hinders, rather than aids, any attempt to vary the amount and/or distribution of adhesive applied to each individual pocket.

Because the '445 application does not teach or suggest varying the amount and/or distribution of adhesive applied to each individual pocket in a string of pocketed coil strings with a plurality of adhesive applicators, as required by amended claim 1 of the present application, any teaching or suggestion of this feature in Mossbeck is not entitled to the September 15, 1998 priority date. Since the priority date of the present application (March 17, 1999) is prior to the filing date of Mossbeck (April 7, 1999), Mossbeck cannot be said to anticipate the claims of the present application. Therefore, the rejection of claims 1-2, 5, and 9 under 35 U.S.C. § 102(e) as anticipated by Mossbeck is improper and should be withdrawn.

The rejection of claim 6 under 35 U.S.C. § 103(a) for obviousness over Mossbeck in view of U.S. Patent No. 5,792,309 to Eto ("Eto") and Published PCT Application WO 96/07345 in the name of St. Clair ("St. Clair") is respectfully traversed.

The teachings of Mossbeck are set forth *supra*.

Eto teaches a pocket coil spring structure assembling apparatus to produce a pocket coil spring structure by bonding rows of pocket coil springs to one another (column 1, lines 54-60). The apparatus includes a feeder mechanism for supplying a group (i.e., a string) of the pocket coil springs to a positioning transfer conveyor (column 1, lines 60-62). The positioning transfer conveyor mechanism conveys the group of the pocket coil springs supplied from the feeder mechanism to a predetermined location (column 1, lines 62-65). The conveyor may be operated by a *motor* (column 4, lines 14-18).

St. Clair teaches innerspring construction and methods for producing innerspring construction whereby strings of pocketed coils are aligned in adjacent rows and are assembled together to form part of an innerspring construction (pg. 6, lines 12-25). A push bar assembly is employed to bring two pocketed coil strings into contact for gluing (pg. 9, lines 16-20). The push bar assembly may be driven back and forth by a pair of *pneumatic* cylinders (pg. 15, lines 20-21).

Because Eto and St. Clair fail to teach or suggest varying the amount and/or distribution of adhesive applied to each individual pocket of a string of pocketed coil springs with a plurality of adhesive applicators, and in light of the above-described deficiencies of Mossbeck, the rejection of claim 6 under 35 U.S.C. § 103(a) for obviousness over Mossbeck in view of Eto and St. Clair is improper and should be withdrawn.

The rejection of claim 7 under 35 U.S.C. §103(a) for obviousness over Mossbeck in view of U.S. Patent No. 5,016,305 to Suenens et al. ("Suenens I") is respectfully traversed.

The teachings of Mossbeck are set forth *supra*.

Suenens I is directed to innerspring construction for mattresses, cushions, and the like, consisting of covered strings of pocketed coil springs which are arranged in such a way that their longitudinal axes are parallel to one another (column 2, lines 17-29). The covered springs are welded at regular distances and are also joined transversely (column 2, lines 29-32). In particular, a string of successive pocketed springs is put on a horizontal conveyor such that the axes of the springs are horizontal and transverse on the direction of movement of the conveyor (column 4, lines 57-60). The conveyor passes for a certain interval underneath a fixed applicator which sprays a coat of adhesive—either continuously or discontinuously—onto at least the central part of a pocket side while the conveyor is moving (column 4, lines 60-64). Spraying can be programmed such that only every other jacket is coated with adhesive (column 4, lines 64-66). The adhesive may consist of plastic adhesive glue, such as a hot melt adhesive (column 2, line 66 to column 3, line 3).

Because Suenens I fails to teach or suggest varying the amount and/or distribution of adhesive applied to each individual pocket of a string of pocketed coil springs with a plurality of adhesive applicators, and in light of the above-described deficiencies of Mossbeck, the rejection of claim 7 under 35 U.S.C. § 103(a) for obviousness over Mossbeck in view of Suenens I is improper and should be withdrawn.

The rejection of claims 1-5 and 7-11 under 35 U.S.C. §103(a) for obviousness over Suenens I in view of Mossbeck is respectfully traversed for substantially the same reasons as described above with respect to the rejection of claim 7.

The rejection of claim 6 under 35 U.S.C. §103(a) as being unpatentable over Suenens I and Mossbeck in view of Eto, European Patent Application No. 0 421 495 A1 of Suenens et al., ("Suenens II"), and Mossbeck is respectfully traversed.

The teachings of Suenens I, Mossbeck, and Eto are set forth *supra*.

Suenens II teaches a method for manufacturing an innerspring construction for mattresses, cushions, and the like (claim 1). A series of strings of jackets encasing coil springs which are arranged separately from each other and with their longitudinal axis substantially parallel to each other and substantially perpendicular to the longitudinal direction of these strings are fixed with adhesive side to side (claim 1). The first string of a particular number of jackets encasing springs is moved according to its longitudinal direction (claim 1). At least one of the longitudinal sides of the string running parallel to the axis of the springs is coated with an adhesive from a fixed spot (claim 1). The coated side is pushed into contact with the corresponding side of a similar second string of pocketed springs, the cycle of operations being repeated on successive strings until an innerspring construction of desired size is obtained (claim 1).

Because Suenens II, Suenens I, and Eto fail to teach or suggest varying the amount and/or distribution of adhesive applied to each individual pocket of a string of pocketed coil springs with a plurality of adhesive applicators, and in light of the above-described deficiencies of Mossbeck, the rejection of claim 6 under 35 U.S.C. §103(a) as being unpatentable over Suenens I and Mossbeck in view of Eto, Suenens II, and Mossbeck is improper and should be withdrawn.

In view of all of the foregoing, applicant submits that this case is in condition for allowance and such allowance is earnestly solicited.

Respectfully submitted,

Date: January 18, 2005

Tate E. Tischner
Registration No. 56,048

NIXON PEABODY LLP
Clinton Square, P.O. Box 31051
Rochester, New York 14603-1051
Telephone: (585) 263-1069
Facsimile: (585) 263-1600

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APPLICATION NUMBER: *09/153,445*
FILING DATE: *September 15, 1998*
PCT APPLICATION NUMBER: *PCT/US99/20920*

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A

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Atty. Docket: L&P / 1023

Applicant: Niels S. Mossbeck, Thomas J. Wells

Title: ADHESIVE BONDING OF STRINGS OF POCKETED COIL SPRINGS

CERTIFICATE OF MAILING BY EXPRESS MAIL - 37 CFR 1.10

'Express Mail' mailing label number: EM032334226US
Date of Deposit: September 15, 1998

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UTILITY PATENT APPLICATION TRANSMITTAL

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

This is a request for filing, under 37 CFR § 1.53(b), a(n):

- ☒ **Original (non-provisional) application.**
- ☐ Divisional of prior application Serial No. __, filed on __.
- ☐ Continuation of prior application Serial No. __, filed on __.
- ☐ Continuation-in-part of prior application Serial No. __, filed on __.

PRELIMINARY AMENDMENT/CALCULATION OF FEES

- ☐ Please cancel claims __ without prejudice, and prior to calculating the fees. __ total claim(s), of which __ is(are) independent, is(are) pending after the amendment.
- ☐ Please enter the enclosed preliminary amendment identified below prior to calculating the fees. __ total claim(s), of which __ is(are) independent, is(are) pending after the amendment.
- ☒ **The Fees are Calculated as Follows:**

Fee:	Number of Claims:	In Excess of:	Extra:	At Rate:	Amount:
Total Claims	35	20	15	$22	$330.00
Independent Claims	3	3	0	$82	$0.00
MULTIPLE DEPENDENT CLAIM FEE					
BASIC FEE					$790.00
TOTAL OF ABOVE CALCULATIONS					$1,120.00
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ENCLOSURES

- ☒ **Utility Patent Application Transmittal Form (in duplicate) containing Certificate of Mailing By Express Mail Under 37 CFR 1.10.**
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APPLICATION PAPERS

- ☒ **Utility Patent Application, with: cover sheet, 25 page(s) specification (including 35 total claim(s), of which 3 is(are) independent), and 1 page(s) abstract.**
- ☒ **Drawings: 3 sheet(s) of formal drawings (11 total figure(s)).**
- ☐ Microfiche Computer Program (Appendix).
- ☐ Nucleotide and/or Amino Acid Sequence, including (all are necessary): Computer Readable Copy, Paper Copy (identical to computer copy), and Statement verifying identity of copies.
- ☒ **An Executed Declaration, Power of Attorney and Petition Form.**
- ☐ Copy of Executed Declaration, Power of Attorney and Petition Form from prior application identified above.
- ☐ Certified Copy of priority document(s) identified as attached above.

ADDITIONAL PAPERS

- ☒ **Assignment to L&P Property Management Company , Recordation Cover Sheet (Form PTO-1595)**
- ☐ Verified Statement to Establish Small Entity Status under 37 CFR 1.9 and 1.27.
- ☐ Preliminary Amendment (to be entered prior to calculation of fees)
- ☐ Information Disclosure Statement, __ sheet(s) Form PTO-1449, __ U.S. Patent Reference(s), __ Foreign Patent Reference(s) and __ Other Reference(s)
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- ☐ Please charge Deposit Account No. 23-3000 in the amount of __.
- ☒ **The Commissioner is authorized to charge any fees under 37 CFR 1.16 and 1.17 which may be required during the entire pendency of the application, or credit any overpayment, to Deposit Account No. 23-3000 . A duplicate of this transmittal is attached.**
- ☐ THE PAYMENT OF FEES IS BEING DEFERRED.

Respectfully Submitted,

Keith R. Haupt
Reg. No. 37,638

WOOD, HERRON & EVANS, L.L.P.
2700 Carew Tower
Cincinnati, Ohio 45202
(513) 241-2324

KRH/llb

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APPLICATION FOR UNITED STATES PATENT

Applicant: Niels S. Mossbeck and Thomas J. Wells

Title: ADHESIVE BONDING OF STRINGS OF POCKETED COIL SPRINGS

Wood, Herron & Evans, L.L.P.
2700 Carew Tower
Cincinnati, Ohio 45202
Attorneys
(513) 241-2324

SPECIFICATION

ADHESIVE BONDING OF STRINGS OF POCKETED COIL SPRINGS

Background of the Invention

This invention relates generally to the construction of spring assemblies or the like. More particularly, it relates to the manufacture of spring cores of strings of pocketed coil springs for use in mattresses, seat cushions or the like.

Mattress spring core construction over the years has been a continuously improving art with advancement in materials and machine technology. A well known form of spring core construction is known as a Marshall spring construction wherein metal coil springs are encapsulated in individual pockets of fabric and formed as elongate or continuous strings of pocketed coil springs. In a early form, these strings of coil springs were manufactured by folding an

elongate piece of fabric in half lengthwise to form two plies of fabric and stitching transverse and longitudinal seams to join the plies of fabric to define pockets in which the springs were enveloped.

Recently, improvements in spring core constructions have included the use of fabrics which are thermally or ultrasonically weldable to themselves. By using such welding techniques, these fabrics have been used advantageously on a mass production basis to more efficiently manufacture strings of individually pocketed coil springs wherein transverse and longitudinal welds replace stitching used to form pockets encapsulating the springs.

The manufacture of strings of pocketed coil springs with a single spring in each pocket is well known in the art and, for example, such machines and systems are commercially available from Spühl AG in Switzerland. Examples of such machines include the Spühl TF 90, 190 and 290 series machines. Another known system for pocketing coil springs is disclosed in U.S. Patent No. 4,439,977 which is hereby incorporated by reference in its entirety.

Once strings of pocketed coil springs are manufactured, they may be assembled to form a spring core construction for a mattress, cushion or the like by a variety of methods. For example, multiple or continuous strings may be arranged in a row pattern corresponding to the desired size and shape of a mattress or the like. The adjacent rows of strings may be interconnected by a variety of

methods. The result is a unitary assembly of pocketed coil springs serving as a complete spring core assembly. In an early form, the rows or strings of such a unitary assembly of pocketed coil springs were interconnected by mechanical fasteners such as staples, clips, or the like. More recently, various forms of adhesives applied to the side surface of a first row or string of pocketed coil springs are used to bond that row or string to an adjacent row or string and thereby construct a unitary spring core assembly.

One example of a spring core assembly constructed from a plurality of strings of pocketed coil springs glued together is disclosed in U.S. Patent No. 4,578,834. Each of the pocketed coil springs in the spring core disclosed in that patent includes a discrete hot melt adhesive deposit on the sidewall thereof. Specific shortcomings associated with that design include the limited bonding strength produced between the adjacent rows of pocketed coil springs because of the individualized discrete deposits of adhesive. Additionally, the requirement of cycling the adhesive applicator rapidly on and off while manufacturing such a spring core assembly can be problematic. Such demands on the adhesive applicator result in frequent maintenance problems and limited and unreliable production capacity.

Spring core constructions manufactured with adjacent strings of pocketed coil springs adhesively bonded together are also

disclosed in U.S. Patent Nos. 4,566,926 and 5,637,178. The system disclosed in the '926 patent includes a hot melt adhesive applicator having a plurality of spray nozzles which apply hot melt adhesive to a selected portion of each pocketed coil spring. The applicator moves longitudinally along the length of a stationary string of pocketed coil springs to apply the hot melt adhesive. On the other hand, the system shown in the '178 patent requires the assembly of spring core constructions from strings of pocketed coil springs in which a first string of coil springs is moved on a conveyor and coated with adhesive sprayed from a fixed adhesive applicator. The manufacturing capacity of each of these systems is limited because of the requirement for a fixed adhesive applicator or a stationary string of pocketed coil springs onto which the adhesive is applied. In those systems, the production of spring core assemblies is the result of a discontinuous or batch like process. Furthermore, the adhesive is not efficiently and optimally applied to the strings of pocketed coil springs for a uniform and unitary spring core assembly.

These identified and other systems provide limited opportunities to manufacture spring core assemblies from pocketed coil springs. There is a need to provide a system and method which can be utilized on a production basis for more complete automation of the procedure for the efficient manufacture of spring core

assemblies from strings of pocketed coil springs adhesively bonded together.

Summary of the Invention

It has therefore been a primary objective of this invention to provide an improved method and system for the manufacture of spring core assemblies from strings of pocketed coil springs.

It has been a further objective of this invention to provide such a method and system which is reliable and cost effective for application in a fully automatic production facility utilizing adhesive bonding of the adjacent strings.

It has been a still further objective of this invention to provide such a method and system which consistently produces appropriately sized and standardized spring core assemblies from strings of pocketed coil springs on a consistent basis.

These and other objectives of the invention have been achieved by a system and method for manufacturing a spring core assembly for use in mattresses, seat cushions or the like. In a presently preferred embodiment, the method includes moving a first string of pocketed coil springs past a moving adhesive applicator in a direction generally perpendicular to the longitudinal axes of the coil springs and spraying adhesive from the applicator onto a side surface

of the moving pocketed coil springs. Advantageously, the adhesive applicator is also moving so the manufacturing method includes a moving adhesive applicator continuously applying adhesive to a moving string of pocketed coils springs to provide a continuous pattern of adhesive on the central portion of each individually pocketed coil spring. Preferably, the movement of the adhesive applicator substantially follows or is synchronized with each pocketed coil spring of the string. In one presently preferred embodiment of this invention, multiple nozzles for dispensing the adhesive from the adhesive applicator are used so that each pocketed coil spring may be followed with a nozzle over a limited range of movement. Furthermore, multiple nozzles offer the advantage of avoiding a single nozzle moving over a limited range with great speed or high frequency and thereby minimizing potential maintenance problems for the system.

In presently preferred embodiments of this invention, the adhesive applicator moves over a limited range in a rotational manner or a reciprocating fashion which may include pivotal movement, linear translational movement or other types of movement.

In a still further presently preferred embodiment of the invention, the continuous spray pattern on the string of pocketed coil springs includes a greater amount of adhesive deposited on the

central portion of each coil spring relative to the remainder of the adhesive pattern. This produces a greater bonding strength between the adjacent strings of pocketed coil springs because the central portion of each spring is typically the primary contact region between the strings of springs.

A continuous spray pattern on the string of pocketed coil springs which results from the moving string and the moving adhesive applicator allows for the coils in each string to be pushed together and adhesively bonded to one another before connecting the string to an adjacent string. As a result, the individual strings can be sized to a standardized dimension which results in a more uniform spring core. The continuous adhesive deposited on the side surface of the string of pocketed coil springs helps in stabilizing and sizing the entire spring unit in comparison to systems where the adhesive is only deposited at discrete locations on the middle regions of the spring pocket. Furthermore, movement of the strings and the adhesive applicator provides for a more continuous production system and method in the manufacture of the spring core unit.

As a result of the present invention, systems and methods for manufacturing spring core assemblies from adhesively bonded strings of pocketed coil springs are provided which improve the production capability for such spring units while improving the

quality of those spring units by providing a more standardized and unitary spring core assembly.

Brief Description of the Drawings

The objectives and features of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

Figs. 1A - 1C are sequential schematic representations of a first presently preferred embodiment of this invention for applying adhesive from a moving adhesive applicator onto a moving string of pocketed coil springs;

Fig. 1D is a schematic representation of a first string of pocketed coil springs being pushed into contact with a second string of pocketed coil springs having adhesive applied on a side surface thereof to form a spring core assembly;

Figs. 2A - 2C are sequential schematic representations of a second presently preferred embodiment of this invention in which a single adhesive applicator reciprocates in a generally linear direction while applying adhesive to a moving string of pocketed coil springs;

Fig. 3 is a schematic representation of a third presently preferred embodiment of this invention with multiple nozzles reciprocating in a generally linear direction while applying adhesive to

the moving string of pocketed coil springs being sized by adhesively bonding adjacent coil springs together; and

Figs. 4A - 4C are sequential schematic representations of another presently preferred embodiment of this invention in which an adhesive applicator includes a plurality of rotating nozzles spraying adhesive onto a string of moving pocketed coil springs.

Detailed Description of the Invention

Referring to Fig. 1D, a spring core unit 10 manufactured from strings of pocketed coil springs according to this invention is shown. The spring core 10 includes a plurality of strings 12 of pocketed coil springs 14. Each string 12 includes a plurality of pockets 14 encapsulating individual coil springs which are typically barrel-shaped with a plurality of normally spaced coils in which terminal end coils thereof have a smaller diameter than the intermediate coils. Alternatively, each pocket 14 may contain a compound nested coil spring as is well known in the art. Each pocketed coil spring 14 has a longitudinal axis 16 extending between the terminal end coils of each spring. Each pocket 14 for the coil springs has an upper and lower longitudinal end 18 spaced from a generally cylindrical or arcuate side surface 20 thereof. The strings 12 of pocketed coil springs 14 may be manufactured according to

any known method or system such as the previously identified Spühl machines or the like.

The spring core 10 is assembled by moving a first string 12a of pocketed coil springs having the side surface 20 thereof with a continuous pattern of adhesive 22 thereon into contact with a similar second string 12b of pocketed coil springs. The adhesive 24 in the pattern 22 bonds the first and second strings 12a, 12b together and the process is repeated with the desired number of strings 12 of pocketed coil springs 14 until a spring core 10 of a desired size is assembled.

The adhesive pattern 22 on the side surface 20 of the strings 12 of pocketed coil springs 14 is preferably located generally equidistance between the longitudinal ends 18 of the pockets 14 and is continuous across the side surface 20 of the pocketed springs. The adhesive pattern 22 includes a region 26 of greater concentration of adhesive on each pocketed coil spring 14 which is located generally equidistance from the adjacent pocketed coil springs 14 of the string 12. In other words, the region 26 of greater concentration of adhesive is generally located on the equator of the pocketed coil spring 14 and on a line perpendicular to the longitudinal axis of the string so that when the pocketed spring 14 is forced into contact with a similar shaped spring, the initial point of contact between them includes the region of greater concentration of

adhesive 26 to thereby securely bond the strings 12 of pocketed coil springs 14 together. Preferably, only one side surface 20 of the string 12 of pocketed coil springs 14 is sprayed with the adhesive 24 so that as the strings 12 are sequentially assembled as shown in Fig. 1D, each string 12 is adhesively bonded to the previous string 12.

Referring to Figs. 1A - 1C, a first presently preferred embodiment of this invention is schematically and sequentially shown. The string 12 of pocketed coil springs 14 is moved on a conveyor or the like past a moving adhesive applicator 28 in the direction of arrow A generally parallel to the longitudinal axis of the string and perpendicular to the longitudinal axes 16 of the coil springs in the string 12. The movement of the adhesive applicator 28 may be rotational, reciprocating in a pivotal or linear manner or any other type of movement. The adhesive applicator 28 includes a nozzle 30 for spraying adhesive 24 onto the side surface 20 of the moving string 12. Preferably, the adhesive 24, adhesive applicator 28 and nozzle 30 are selected from any one of a number of such components which are well known in the industry for this purpose.

Preferably, the adhesive 24 is continuously sprayed from the nozzle 30 which, according to the embodiment in Figs. 1A - 1C, reciprocates and pivots about a pivot axis 32 as shown sequentially in the drawings. Preferably, the adhesive 24 being sprayed from the nozzle 30 is directed to one individual pocketed coil

spring 14a of the string 12 at a time. Specifically, as shown in Fig. 1A, as a specific pocketed coil spring 14a approaches the adhesive applicator 28, the nozzle 30 is directed to spray the side surface 20 of the pocketed coil spring 14a in a generally tangential orientation. As the specific pocketed coil spring 14a continues to travel in the direction of arrow A, the nozzle 30 pivots, as shown in Fig. 1B, so that the adhesive spray 24 is continually directed towards that pocketed coil spring 14a. When the pocketed coil spring 14a is immediately in front of the adhesive applicator 28, the nozzle 30 is directed generally perpendicular to the direction of travel of the string 12 and produces a generally radially directed spray on the pocketed coil spring 14. Continued movement of the string 12 as shown in Fig. 1C is synchronized with continual pivoting of the nozzle 30 so that the spray 24 once again is in a generally tangential orientation relative to the circumference of the pocketed coil spring 14a. The nozzle 30 reciprocates back toward the position of Figs. 1B and 1A sequentially for continuous spraying of the specific pocketed coil spring 14a and then a subsequent adjacent coil spring 14b approaching the adhesive applicator 28.

As a result of the coordinated movement of the adhesive applicator 28 and the string 12 of pocketed coil springs 14, the continuous pattern of adhesive 22 on the center part of the individual encased coil springs 14 is produced with the nozzle 30

substantially following and thereby spraying adhesive 24 onto each pocketed coil spring 14 as it passes the adhesive applicator 30. In one specific embodiment, the string 12 of pocketed coil springs 14 moves with a speed of approximately one meter per second which results in typically about 17 pocketed coil springs 14 per second moving past the adhesive applicator 30. As a result of the continuous spray 24 from the nozzle 30 and the movement of the adhesive applicator 30 relative to the moving string 12 of pocketed coil springs 14, primarily the radially directed spray as shown in Fig. 1B, the pattern of adhesive 22 on the string 12 produces the region of greater concentration 26 of adhesive as shown in Fig. 1D.

Referring to Figs. 2A - 2C and Fig. 3, alternative presently preferred embodiments of this invention are shown in which the adhesive applicator 28 moves by reciprocating in a linear direction or path that is generally parallel to the direction of travel of the string 12 of pocketed coil springs 14. In the embodiment of Figs. 2A - 2C, the nozzle 30 is focused on generally the center region of a specific pocketed coil spring 14a and follows the movement of that pocketed coil spring 14a at preferably the same velocity, for example, one meter per second, until it reaches the position of Fig. 2C at which time it reciprocates back through the position shown in Fig. 2B toward the position of Fig. 2A for direct spray upon a subsequent adjacent pocketed coil spring 14b in the string 12. As a

result, the region of greater concentration of adhesive 26 is produced on each pocketed coil spring 14 in the string 12 as well as the continuous spray pattern on the string 12 due to the reciprocating movement of the applicator 28. As shown in Fig. 3, a plurality of nozzles 30, two of which are shown in Fig. 3, may be mounted upon the adhesive applicator 28 for direct and continuous spray on the string 12 of moving pocketed coil springs 14.

Referring to Figs. 4A - 4C, another presently preferred embodiment is shown in which the adhesive applicator 28 includes a plurality of nozzles 30, six of which are shown, which rotate about an axis 34. The adhesive applicator 28 in this embodiment includes multiple nozzles 30, only one of which is activated at any given time for spraying the adhesive 24 onto the moving string 12 of pocketed coil springs 14 so that the adhesive 24 from the active nozzle 30a is sprayed onto a single pocketed coil spring 14a as it moves past the adhesive applicator 28. Once the particular nozzle 30a reaches the position relative to the particular pocketed coil spring 14a shown in Fig. 4C, the adhesive 24 ceases to be sprayed from that nozzle 30a and begins to be discharged from the subsequent adjacent nozzle 30b and directed onto the subsequent adjacent pocketed coil spring 14b and the process begins once again as shown in Fig. 4A. Advantageously, the system of Figs. 4A - 4C produces a continuous adhesive pattern 22 on the string 12 of pocketed coil springs 14

which includes a region of greater concentration of adhesive 26 along the central part of each pocketed coil spring 14 as shown in Fig. 1D. As will be readily apparent to one of ordinary skill in the art, to produce the adhesive pattern 22 as described, the movement of the adhesive applicator 28, whether pivotal, rotation, translational or the like, is preferably coordinated with the movement of the string 12 of pocketed coil springs 14.

A still further advantage of the present invention is shown in Fig. 3. Particularly, known strings 12 of pocketed coil springs 14 include lateral seams 36 joining the adjacent pocketed coil springs 14 together. Due to the nature of the pocketing material and the string of pocketed coil springs, the length of the string 12 of a particular number of pocketed coil springs 14 may not be consistent because of the stretching of the fabric or the capability of the string 12 to be expanded by increasing or decreasing the spacing between the adjacent pocketed coil springs 14. A particular advantage of the system and method according to this invention is that the adjacent pocketed coil springs 14 in the string 12 may be adhesively bonded together to thereby standardize or size the length of each string 12. Specifically, the pattern of adhesive 22 sprayed onto the string 12 is generally continuous, a portion 38 of which is sprayed onto the region of the pocketed coil springs 14 adjacent to one another (i.e., bordering the region of greater adhesive concentration and adjacent

the seams 36). Therefore, the adjacent pocketed coil springs 14 can be adhesively bonded together by this region of adhesive 38 by forcing the adjacent pocketed coil springs 14 together at a single location for each string 12 as shown in Fig. 3 or at multiple locations for each string 12. As a result, the length of the string 12 of pocketed coil springs 14 can be standardized or sized for a more uniform spring core 10 having standardized and sized strings 12 of pocketed coil springs 14.

From the above disclosure of the general principles of the present invention and the preceding detailed description of preferred embodiments, those skilled in the art will readily comprehend the various modifications to which this invention is susceptible. Therefore, we desire to be limited only by the scope of the following claims and equivalents thereof.

WE CLAIM:

1. A method for manufacturing a spring core comprising the steps of:

providing a first string of pocketed coil springs, the coil springs having longitudinal axes which are substantially parallel to each other;

moving the first string past an adhesive applicator and in a direction generally perpendicular to the longitudinal axes of the coil springs;

spraying an adhesive from the adhesive applicator onto a side surface of the moving pocketed coil springs;

moving the adhesive applicator so that the adhesive being sprayed therefrom forms a pattern on the side surfaces of the pocketed coil springs;

moving the first string relative to a similar second string of pocketed coil springs so that the sprayed side surface of the second string contacts the first string and thereby adhesively bonds the first and second strings together; and

repeating the steps until the spring core of a desired size is manufactured.

2. The method of claim 1 wherein the moving of the adhesive applicator further comprises reciprocating movement.

3. The method of claim 1 wherein the moving of the adhesive applicator is limited to a plane generally parallel to the direction of movement of the pocketed coil springs.

4. The method of claim 1 wherein the moving of the adhesive applicator further comprises pivotal movement.

5. The method of claim 1 wherein the moving of the adhesive applicator further comprises rotational movement.

6. The method of claim 1 wherein the moving of the adhesive applicator further comprises linear translational movement.

7. The method of claim 1 wherein the spraying of the adhesive is generally on only one of the pocketed coil springs at a time.

8. The method of claim 1 wherein the spraying further comprises spraying the adhesive from a plurality of nozzles on the adhesive applicator.

9. The method of claim 8 wherein the adhesive is sprayed from only one of the nozzles at a time.

10. The method of claim 1 wherein the pattern of adhesive includes a region of greater concentration of adhesive relative to a remainder of the pattern.

11. The method of claim 10 wherein the region of greater concentration of adhesive on each pocketed coil spring is located generally equidistance from adjacent pocketed coil springs of the first string and generally equidistance from longitudinal ends of the pocketed coil spring.

12. The method of claim 1 wherein the pattern of adhesive is generally continuous along the first string of pocketed coil springs.

13. The method of claim 1 wherein the spraying of the adhesive is generally continuous.

14. The method of claim 1 further comprising:

bonding at least selected ones of the pocketed coil springs of the first string to adjacent pocketed coil springs of the first string to thereby regulate a length of each string of pocketed coil springs.

15. A method for manufacturing a spring core comprising the steps of:

providing a first string of pocketed coil springs, the coil springs having longitudinal axes which are substantially parallel to each other;

moving the first string past an adhesive applicator and in a direction generally perpendicular to the longitudinal axes of the coil springs;

generally continuously spraying an adhesive from the adhesive applicator onto a side surface of the moving pocketed coil springs, the spraying of the adhesive being generally on only one of the pocketed coil springs at a time;

moving the adhesive applicator within a plane generally parallel to the direction of movement of the pocketed coil springs so that the adhesive being sprayed therefrom forms a pattern on the side surfaces of the pocketed coil springs, the pattern of adhesive being generally continuous along the first string of pocketed coil springs and including a region of greater concentration of adhesive relative to a remainder of the pattern, the region of greater concentration of adhesive being located generally equidistance from adjacent pocketed coil springs of the first string and generally equidistance from longitudinal ends of the pocketed coil spring;

moving the first string relative to a similar second string of pocketed coil springs so that the sprayed side surface of the second string contacts the first string and thereby adhesively bonds the first and second strings together; and

repeating the steps until the spring core of a desired size is manufactured.

16. The method of claim 15 wherein the moving of the adhesive applicator further comprises reciprocating movement.

17. The method of claim 15 wherein the moving of the adhesive applicator further comprises pivotal movement.

18. The method of claim 15 wherein the moving of the adhesive applicator further comprises rotational movement.

19. The method of claim 15 wherein the moving of the adhesive applicator further comprises linear translational movement.

20. The method of claim 15 wherein the spraying further comprises spraying the adhesive from a plurality of nozzles on the adhesive applicator.

21. The method of claim 20 wherein the adhesive is sprayed from only one of the nozzles at a time.

22. The method of claim 15 further comprising:

bonding at least selected ones of the pocketed coil springs of the first string to adjacent pocketed coil springs of the first string to thereby regulate a length of each string of pocketed coil springs.

23. A spring core manufactured according to a method comprising the steps of:

providing a first string of pocketed coil springs, the coil springs having longitudinal axes which are substantially parallel to each other;

moving the first string past an adhesive applicator and in a direction generally perpendicular to the longitudinal axes of the coil springs;

spraying an adhesive from the adhesive applicator onto a side surface of the moving pocketed coil springs;

moving the adhesive applicator so that the adhesive being sprayed therefrom forms a pattern on the side surfaces of the pocketed coil springs;

moving the first string relative to a similar second string of pocketed coil springs so that the sprayed side surface of the second string contacts the first string and thereby adhesively bonds the first and second strings together; and

repeating the steps until the spring core of a desired size is manufactured.

24. The spring core of claim 23 wherein the moving of the adhesive applicator further comprises reciprocating movement.

25. The spring core of claim 23 wherein the moving of the adhesive applicator further comprises pivotal movement.

26. The spring core of claim 23 wherein the moving of the adhesive applicator further comprises rotational movement.

27. The spring core of claim 23 wherein the moving of the adhesive applicator further comprises linear translational movement.

28. The spring core of claim 23 wherein the spraying of the adhesive is generally on only one of the pocketed coil springs at a time.

29. The spring core of claim 23 wherein the spraying further comprises spraying the adhesive from a plurality of nozzles on the adhesive applicator.

30. The spring core of claim 29 wherein the adhesive is sprayed from only one of the nozzles at a time.

31. The spring core of claim 23 wherein the pattern of adhesive includes a region of greater concentration of adhesive relative to a remainder of the pattern.

32. The spring core of claim 31 wherein the region of greater concentration of adhesive on each pocketed coil spring is located generally equidistance from adjacent pocketed coil springs of the first string and generally equidistance from longitudinal ends of the pocketed coil spring.

33. The spring core of claim 23 wherein the pattern of adhesive is generally continuous along the first string of pocketed coil springs.

34. The spring core of claim 23 wherein the spraying of the adhesive is generally continuous.

35. The spring core of claim 23 further comprising:

bonding at least selected ones of the pocketed coil springs of the first string to adjacent pocketed coil springs of the first string to thereby regulate a length of each string of pocketed coil springs.

ADHESIVE BONDING OF STRINGS OF POCKETED COIL SPRINGS

Abstract of the Disclosure

A method and system for manufacturing a spring core by adhesively bonding strings of pocketed coil springs together utilizes a moving adhesive applicator for depositing adhesive onto a moving string of pocketed coil springs. Subsequently, individual strings are adhesively bonded to similar strings to form the spring core of pocketed coil springs. The moving applicator may take one of any number of various embodiments which include reciprocating movement, rotational movement, pivotal movement and/or linear translational movement for spraying a continuous stripe pattern of adhesive onto the moving string of pocketed coil springs.

Declassified

Express Mail No. EM032334226US Attorney Docket No. L&P/1023

DECLARATION, POWER OF ATTORNEY, AND PETITION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ADHESIVE BONDING OF STRINGS OF POCKETED COIL SPRINGS

the specification of which (check one below):

(✓) is attached hereto.

( ) was filed on ___ as Application Serial No. ___ or Express Mail No. ___, and was amended on ___ (if applicable).

( ) was filed on ___ as PCT International Application No. ___ , and as amended under PCT Article 19 on ___ (if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s) Priority Claimed?

(Number)	(Country)	Day/Month/Year Filed	
			( ) Yes ( ) No
			( ) Yes ( ) No
			( ) Yes ( ) No

I hereby claim the benefit under Title 35, United States Code, §120 and/or §119(e) of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Serial No.)	(Filing Date)	(Status: Patented, Pending, or Abandoned)

I hereby appoint John D. Poffenberger (R. No. 20,245), Bruce Tittel (R. No. 22,324), Donald F. Frei (R. No. 21,190), David J. Josephic (R. No. 22,849), A. Ralph Navaro, Jr. (R. No. 23,050), David S. Stallard (R. No. 25,930), J. Robert Chambers (R. No. 25,448), Gregory J. Lunn (R. No. 29,945), Kurt L. Grossman (R. No. 29,799), Clement H. Luken, Jr. (R. No. 32,742), Thomas J. Burger (R. No. 32,662), Gregory F. Ahrens (R. No. 32,957), Wayne L. Jacobs (R. No. 35,553), Joseph R. Jordan (R. No. 25,686), Kurt A. Summe (R. No. 36,023), Keith R. Haupt (R. No. 37,638), Kevin G. Rooney (R. No. 36,330), C. Richard Eby (R. No. 25,854), Theodore R. Remaklus (R. No. 38,754), Thomas W. Humphrey (R. No. 34,353), David E. Pritchard (R. No. 38,273), David H. Brinkman (R. No. 40,532), Stephen W. Barns (R. No. 38,037), J. Dwight Poffenberger, Jr. (R. No. 35,324), Beverly A. Lyman (R. No. 41,961), Scott A. Stinebruner (R. No. 38,323), David E. Franklin (R. No. 39,194), Herbert C. Brinkman (R. No. 16,955), all of Wood, Herron & Evans, L.L.P.,

2700 Carew Tower, 441 Vine Street, Cincinnati, OH 45202-2917, telephone no. (513) 241-2324, my attorneys, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. Address all correspondence and telephone calls to

Keith R. Haupt
Wood, Herron & Evans, L.L.P.
2700 Carew Tower
441 Vine Street
Cincinnati, OH 45202-2917
Telephone (513) 241-2324

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of Inventor Niels S. Mossbeck

Inventor's Signature _____ Date 9/9-98

Residence City/State Dayton, Tennessee Citizenship Denmark

Post Office Address 137 Gholdston Lane, Dayton, Tennessee 37321

Full name of Inventor Thomas J. Wells

Inventor's Signature _____ Date 9 Sept 98

Residence City/State Carthage, Missouri Citizenship USA

Post Office Address 801 Country Club Road, Carthage MO 64836

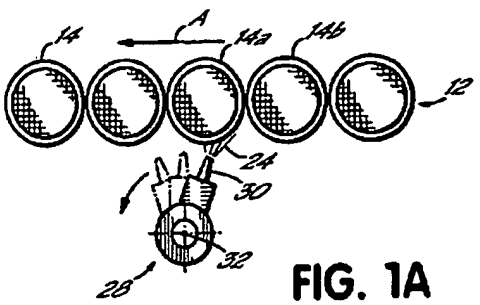

FIG. 1A

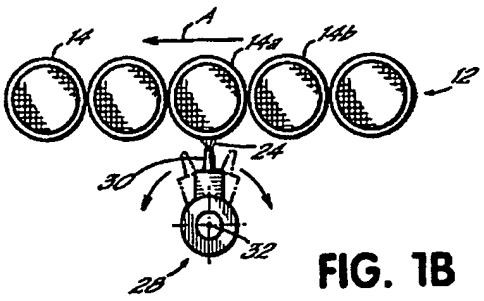

FIG. 1B

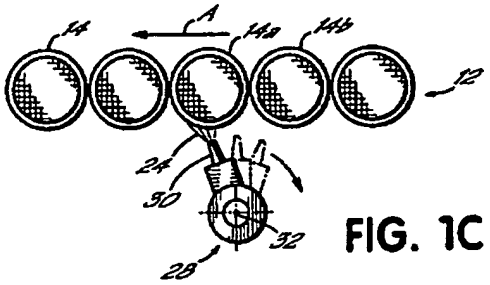

FIG. 1C

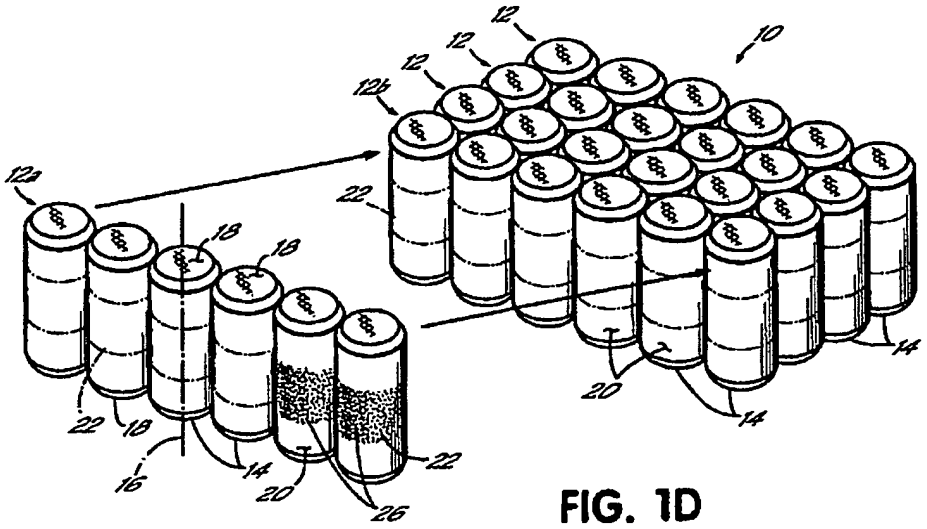

FIG. 1D

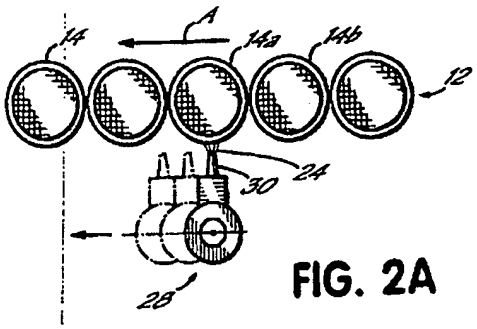

FIG. 2A

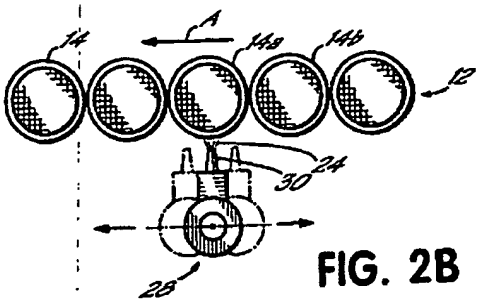

FIG. 2B

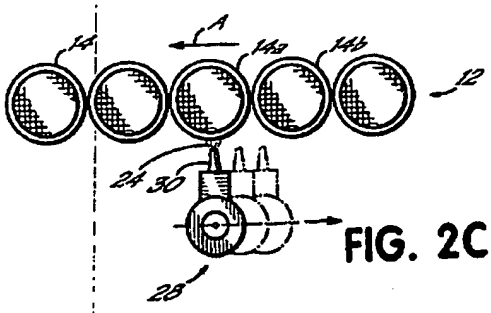

FIG. 2C

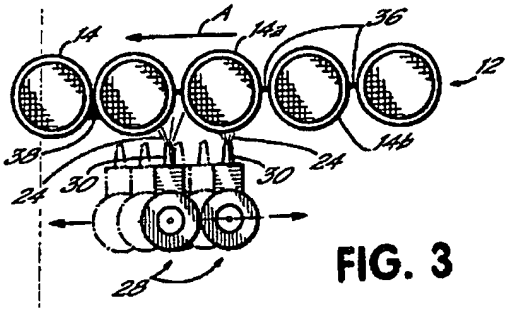

FIG. 3

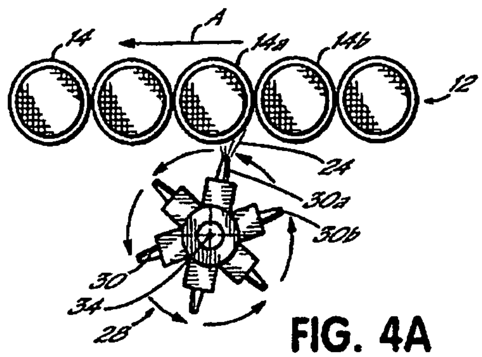

FIG. 4A

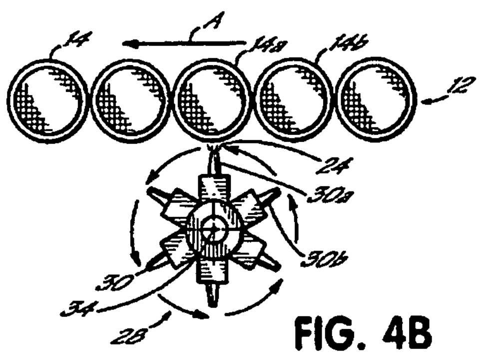

FIG. 4B

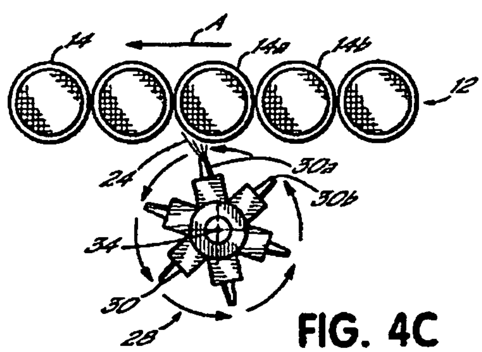

FIG. 4C

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